

1                   **IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

2                                   **TITLE OF THE INVENTION**

3    Standing Seam Skylight

4                                   **CROSS-REFERENCE TO RELATED APPLICATIONS**

5    Not Applicable.

6                                   **STATEMENT REGARDING FEDERALLY SPONSORED**  
7                                   **RESEARCH OR DEVELOPMENT**

8    Not Applicable.

9                                   **BACKGROUND OF THE INVENTION**

10       Field of the Invention. The invention is generally related to roofing skylights and  
11    more specifically to modularly integrated skylights for standing seam roofs.

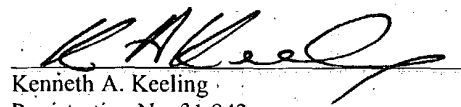
12       Description of the Related Art. Skylights installed in roofs are widely practiced. In  
13    roofs with a standing seam roofing system prior art skylights have been affixed to adjacent  
14    roof panels by utilizing the standing seams of those roof panels.

15       U.S. Pat. No. 4,649,680 issued to Weisner et al. on March 17, 1987, discloses a  
16    skylight system for a standing seam roof in which plastic skylight sections are formed to  
17    have the same width as a standard metal roof panel and shaped to integrate into the standing  
18    seam roof in place of a standard metal roof panel between two standing seams. U.S. Pat. No.  
19    4,117,638 issued to Kidd, Jr. et al. on October 3, 1978, discloses a skylight panel where the

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Date: 8/1/03

  
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1 transparent panel is shaped to clip into the standing rib interface in place of a metal central  
2 panel.

3 U.S. Pat. No. 4,730,426 issued to Weisner, et al. on March 15, 1988 discloses a  
4 skylight for a barrel tile roof. The skylight is made of plastic and folded along the edges to  
5 mate with the standing seams on each side of the skylight. The width of the skylight is the  
6 width of an integral number of roof tiles, creating joints at each standing seam.

7 Other prior art skylights are installed into the flat portion of the roof panel between  
8 the standing seams.

9 U.S. Pat. No. 5,323,576 issued to Gumpert et al. on June 28, 1994, discloses a  
10 skylight system for use on metal standing seam roofs. The skylight is curbless and integrates  
11 into the flat metal panel between two adjacent standing seams. The roof panel is cut and the  
12 edges are folded back to form a lip over which a bubble-shaped covering is placed and  
13 sealed. In this manner, material is shed off the roof between the two standing seams and able  
14 to flow past the skylight.

15 U.S. Pat. No. 4,848,051 issued to Weisner et al. on July 18, 1989, discloses a low  
16 profile skylight for a shingled sloping roof with a unitary rectangular frame having an  
17 upstanding standing seam element along each longitudinal edge. Head and sill flashings are  
18 provided to seal the remaining perimeter of the skylight.

19 U.S. Pat. No. 4,860,511 issued to Weisner et al. on August 29, 1989, discloses a  
20 curbless skylight having a central dome and a pair of standing seam edges suitable for  
21 installation in a metal standing seam roof, wherein the standing seam edges are joined to  
22 adjacent metal standing seams with the same covered by battens.

1 It would be an improvement to the field to provide a skylight for standing seam roofs  
2 that spans across at least one standing seam, and integrated into a section of the standing  
3 seam panels, so as to be installed into the roof as a unitary component. It would be an  
4 improvement to the field to have the skylight assembly match the color of the metal standing  
5 seam roof.

#### 6 BRIEF SUMMARY OF THE INVENTION

7 Accordingly, the objects of my invention are to provide, inter alia, a skylight for a  
8 standing seam roof that:

- 9 • integrates into the standing seam connection system of the remainder of the roof;
- 10 • accommodates a skylight panel that may span at least one standing seam; and
- 11 • integrates into different types of standing seam connectors.

12 Other objects of my invention will become evident throughout the reading of this  
13 application.

14 My invention is a skylight for a standing seam roof comprising a durable gauge  
15 skylight panel frame integrated into at least one section of the particular roofing material  
16 being used.

#### 17 BRIEF DESCRIPTION OF THE DRAWINGS

18 Figure 1 is a top view of the preferred embodiment of the skylight assembly for a  
19 standing seam roof.

20 Figure 2 is a cross-sectional view of the preferred embodiment of the skylight frame  
21 interlocking with modified standing seam roof panels.

1           Figure 3 is an enlarged cross-sectional view of an embodiment of the skylight frame  
2 interface with a modified standing seam roof panel.

3           Figure 4 is an enlarged cross-sectional view of an embodiment of the skylight frame  
4 interface with top end piece and a water diverter.

5           Figure 5 is a perspective view of an embodiment of the skylight frame assembly.

6           Figure 6 is a top view of a partially modified roof panel.

7           Figure 7 is a top view of a partially modified roof panel.

8           Figure 8 is a perspective view of a modified roof panel.

9           Figure 9 is a perspective view of a notch and cap on the lower edge of the skylight  
10 assembly.

11          Figure 10 is a perspective view of a prior art standing seam connection.

12          Figure 11 is a side view of a prior art standing seam connection.

### 13                               DESCRIPTION OF THE INVENTION

14          The preferred embodiment of my standing seam skylight assembly is shown in Figs.  
15 1-8. The standing seam skylight assembly is depicted as 10.

16          Referring to Figs. 10 and 11, a prior art typical standing seam 121 is shown. Typical  
17 standing seam 121 joins two typical roof panels 120a and 120b. Each roofing panel in a  
18 project has a typical inner connector 122 along one edge and a typical outer connector 123  
19 along the opposing edge. Fig. 11 depicts typical standing seam 121, which is created by  
20 inserting typical inner connector 122 along one side of typical roof panel 120b into typical  
21 outer connector 123 of one side of typical roof panel 120a in an interference fit. In this  
22 manner, many roofing panels can be joined to form a complete roof.

1 Referring to Fig. 1, standing seam skylight assembly 10 is comprised of a skylight  
2 frame assembly 50, two roof panels 20a and 20b, a top end piece 41, and a bottom end piece  
3 45. Roof panels 20a and 20b are immediately adjacent opposing sides of skylight frame  
4 assembly 50. Top end piece 41 and bottom end piece 45 are located between roof panels 20a  
5 and 20b and are immediately adjacent opposing ends of skylight frame assembly 50. Top  
6 end piece 41 and bottom end piece 45 may partially overlap each roof panel 20a and 20b.  
7 Skylight assembly 10 has skylight assembly upper edge 12 and skylight assembly lower edge  
8 15. Skylight assembly upper edge 12 is at a higher elevation than skylight assembly lower  
9 edge 15 when skylight assembly 10 is integrated into a sloped roof.

10 Referring to Fig. 5, the skylight frame assembly 50 comprises a skylight curb 70 and  
11 a translucent or transparent skylight panel 52. Skylight frame assembly 50 has an upper end  
12 62, a lower end 64, and two longitudinal sides 66a and 66b. Upper end 62 is that end with a  
13 higher elevation along the pitch of a sloped roof when skylight assembly 10 is installed in a  
14 sloped roof. Upper end 62 has a top frame width 63. Lower end 64 has a lower frame width  
15 65. Lower end 64 and upper end 62 are along opposing ends of skylight frame assembly 50.  
16 Each of the two longitudinal sides 66a and 66b extends between the extremities of upper end  
17 62 and lower end 64 to form a rectangular frame shape. Skylight curb 70 houses skylight  
18 panel 52. Skylight curb 70 has an inner periphery 69 defined as that part of skylight curb 70  
19 immediately adjacent and surrounding skylight panel 52. A skylight curb length 75 is the  
20 longitudinal length of skylight curb 70.

21 Referring to Figs. 3 and 5, skylight curb 70 extends around skylight panel 52 and is  
22 C-shaped with the open portion of the "C" facing away from inner periphery 69. In the

1 exemplary embodiment, skylight curb 70 comprises a frame ledge 72, a skylight curb side  
2 member 73, a skylight curb top member 76, and a skylight curb lip 77. Skylight curb side  
3 member 73 encompasses inner periphery 69 of skylight curb 70. Skylight curb side member  
4 73 and frame ledge 72 are adjoined perpendicularly along a common edge while skylight  
5 curb top member 76 is adjoined perpendicularly to the opposing edge of skylight curb side  
6 member 73. Frame ledge 72 and skylight curb top member 76 are positioned such that  
7 skylight curb top member 76 is parallel to and overhangs frame ledge 72. A skylight curb  
8 height 74 is defined as the distance between facing surfaces of skylight curb top member 76  
9 and frame ledge 72. Skylight curb lip 77 is perpendicularly adjoined to skylight curb top  
10 member 76 along an outer corner 78, distal skylight curb side member 73 and extends toward  
11 frame ledge 72, thus forming a C-shape. A skylight curb width 79 is defined as the distance  
12 between facing surfaces of skylight curb side member 73 and skylight curb lip 77.

13 Referring to Figs. 2 and 3, the exemplary embodiment of the interface, curb interface  
14 30, between skylight curb 70 and roof panels 20a and 20b is shown. Roof panels 20a and  
15 20b are each adapted to interface with skylight curb 70 along longitudinal sides 66a and 66b.

16 Referring to Figs. 6 and 7, roof panels, 20a and 20b are shown. Roof panels 20a and  
17 20b are selected from roofing panels that are to be used in the roofing project. Roof panels  
18 20a and 20b are modified to accommodate skylight frame assembly 50. As shown in Fig. 6,  
19 to prepare roof panels 20a and 20b for assembly with skylight frame assembly 50, the inner  
20 connector (not shown) of one roof panel 20a is removed leaving an inner connector edge 24,  
21 which is straight. An outer connector 23 remains along the edge opposing inner connector  
22 edge 24. Fig. 7 shows roof panel 20b with the outer connector (not shown) removed, leaving

1 an outer connector edge 26, which is also straight. An inner connector 22 remains along the  
2 edge opposite outer connector edge 26. Outer connector 23 and inner connector 22 may be  
3 referred to herein as panel attachment members. Inner connector edge 24 and outer  
4 connector edge 26 may be referred to herein as frame interface edges.

5 Two slits 27a and 27b are cut into a panel surface 25a of roof panel 20a from inner  
6 connector edge 24 in a direction perpendicular to inner connector edge 24. Similarly, two  
7 slits 27c and 27d are cut perpendicular to outer connector edge 26 from outer connector edge  
8 26 into panel surface 25b of roof panel 20b. Some material along inner connector edge 24  
9 outside slits 27a and 27b may be removed as may some material along outer connector edge  
10 26 outside slits 27c and 27d.

11 The edge between slits 27a and 27b is a panel curb edge 88a and the edge between  
12 slits 27c and 27d is a panel curb edge 88b. The distance between slits 27a and 27b on roof  
13 panel 20a is a panel curb length 87a and between slits 27c and 27d on roof panel 20b is a  
14 panel curb length 87b. Panel curb lengths 87a and 87b are each equivalent to skylight curb  
15 length 75 plus an allowance for a curb thickness 35, shown in Fig. 4, which will be present at  
16 the interfaces between skylight curb 70 and top end piece 41 and skylight curb 70 and bottom  
17 end piece 45, discussed below. The distance between panel curb edge 88a and the ends of  
18 slit 27a and 27b is a slit length 28, which is equivalent to the sum of skylight curb height 74  
19 and skylight curb width 79. Surface material between slits 27a and 27b and between slits 27c  
20 and 27d may have to be removed to accommodate top frame width 63 and lower frame width  
21 65 while maintaining the proper slit length 28. Panel surface 25a between slits 27a and 27b

1 on roof panel 20a and panel surface 25b between slits 27c and 27d on roof panel 20b are bent  
2 to form a panel curb 80, shown in Fig. 8.

3 Referring to Fig. 8, in the exemplary embodiment, panel curb 80 comprises a panel  
4 surface 25a, a panel curb side 82, and a panel curb lip 84. Panel curb 80 is formed by  
5 bending roof panel 20a along panel surface 25a between slits 27a and 27b perpendicular to  
6 the panel surface 25a to form panel curb side 82. Panel surface 25a is bent such that panel  
7 curb side 82 extends upwards, in the same direction as outer connector 23 along the edge  
8 opposite inner connector edge 24 of roof panel 20a. Panel curb side 82 is then bent toward  
9 outer connector 23 of the roof panel 20a so that it is parallel to and overhangs panel surface  
10 25a, thereby forming panel curb lip 84. Thus, panel curb 80 is U-shaped. A panel curb end  
11 86 is located along the free edge of panel curb lip 84. Panel curb 80 has a height 83 and  
12 panel curb lip 84 has a width 85. The height 83 of panel curb 80 and the width 85 of panel  
13 curb lip 84 are such that panel curb 80 has an edge shape firmly receivable within the shape  
14 of the skylight curb 70. As shown in Fig. 3, the U-shape of panel curb 80 fits within the C-  
15 shape of skylight curb 70 along longitudinal sides 66a and 66b. Roof panel 20b is prepared  
16 in the same manner as roof panel 20a with panel curb 80 formed along outer connector edge  
17 26 between slits 27c and 27d.

18 Referring to Fig. 3, the interface between roof panel 20b panel curb 80 and skylight  
19 curb 70 is shown. Insulation 56, which is optional, but preferably included, is also shown,  
20 snugly sandwiched between panel curb 80 and skylight curb 70. Panel curb side 82 of panel  
21 curb 80, abuts against the insulation 56. The snug fit of insulation 56 against panel curb side  
22 82 causes panel curb end 86 to press against the inside of skylight curb lip 77 at outer corner



1 78. The tension between the U-shaped panel curb 80 and the C-shaped skylight curb 70  
2 results in panel surface 25b and frame ledge 72 abutting parallel, such that frame ledge 72  
3 provides support and rigidity to panel surface 25b.

4 Referring to Fig. 1, top end piece 41 and bottom end piece 45 are shown along upper  
5 end 62 and lower end 64 of skylight frame assembly 50. In the preferred embodiment, both  
6 top end piece 41 and bottom end piece 45 are made from one or more flat sheets of roofing  
7 material obtained with roof panels 20a and 20b for the roofing project. Thus, top end piece  
8 41 and bottom end piece 45 match the color of the roofing project. Top and bottom end  
9 pieces 41 and 45 interface with top and lower ends 62 and 64 of skylight frame assembly 50  
10 in a manner similar to the interface between roof panels 20a and 20b and skylight frame  
11 assembly 50 along longitudinal sides 66a and 66b.

12 Fig. 4 depicts the interface between top end piece 41 and skylight curb 70. In the  
13 exemplary embodiment, top end piece 41 has a U-shaped curb section 42 along the side  
14 interfacing with skylight curb 70 and is otherwise flat. U-shaped curb section 42 of top end  
15 piece 41 interlocks with the C-shape of skylight curb 70. Insulation 56 is preferably included  
16 between curb section 42 and skylight curb 70. Curb thickness 35 is the thickness of  
17 insulation 56 plus the immediately adjacent surfaces of top end piece 41 and skylight curb  
18 side member 73. The interface along lower end 64 of skylight frame assembly 50 with  
19 bottom end piece 45 is the same as that just described. Appropriate roofing sealer (not  
20 shown) is optional, but may be used where frame ledge 72 of skylight curb 70 and top and  
21 bottom end pieces 41 and 45 overlap. Roof panels 20a and 20b overlap top end piece 41 and  
22 bottom end piece 45 to provide additional support to the surface of roof panels 20a and 20b

1 and to prevent leakage. Therefore, panel curb length 87 must allow for curb thickness 35 in  
2 addition to skylight curb length 75.

3 Referring to Figs. 1 and 4, a water diverter 54, also known as a cricket, may be  
4 affixed to top end piece 41. Many types of water diverters 54 are practiced in the skylight  
5 industry and may be used to divert water around skylight frame assembly 50. One type of  
6 water diverter 54 attaches to top end piece 41 at diverter attachment point 55. From diverter  
7 attachment point 55, water diverter 54 slants downward and is affixed to top end piece 41.  
8 Water diverter 54 has a centrally-located fold 53 thereby forming two triangularly-shaped  
9 sloped surfaces 51a and 51b extending from fold 53 to top end piece 41. Thus, water flowing  
10 down skylight assembly 10 is diverted from skylight frame assembly 50, preventing leakage.  
11 Other styles of water diverters, which are not depicted, include components that have walls  
12 raised vertically from the roof panel surface rather than triangularly-shaped surfaces. The  
13 walls are positioned such that they direct flowing water away from the skylight frame  
14 assembly 50.

15 Referring to Figs. 1 and 9, when skylight assembly 10 is used in a roofing project,  
16 skylight assembly lower edge 15 may be located such that it overlaps the top of other roofing  
17 panels (not shown) used in the project. Because skylight assembly 10 may be wider than the  
18 roofing panels in the project, one or more notches 59 are cut along the skylight assembly  
19 lower edge 15 to accommodate the standing seam(s) (not shown) of the lower adjacent roof  
20 panels (not shown). When skylight assembly 10 is the width of two roofing panels, one  
21 standing seam (not shown) is traversed by skylight assembly 10 and one notch 59 is cut along  
22 skylight assembly lower edge 15. When skylight assembly 10 is the width of three roofing

1 panels, two standing seams are traversed by the skylight assembly 10 and two notches 59 are  
2 cut along skylight assembly lower edge 15 and so on. Caps 58 are placed over the end of  
3 each of the lower adjacent standing seams. Other roofing panels in the project might be  
4 located such that they overlap skylight assembly upper edge 12. When necessary, caps 58  
5 are placed over the end of the standing seams of these roofing panels as well.

6 Referring again to Fig. 1, skylight frame assembly 50 is constructed of material  
7 sufficiently rigid enough to support skylight panel 52. Once skylight frame assembly 50 is  
8 integrated into roof panels 20a and 20b and top and bottom end pieces 41 and 45, it can then  
9 be employed in a roofing project similar to other panels in the project, with outer connector  
10 23 on roof panel 20a connecting to an inner connector (not shown) of an adjacent roof panel  
11 (not shown) and inner connector 22 of roof panel 20b connecting to outer connector (not  
12 shown) of an adjacent roof panel (not shown).

13 The foregoing disclosure and description of the invention is illustrative and  
14 explanatory thereof. Various changes in the details of the illustrated construction may be  
15 made within the scope of the appended claims without departing from the spirit of the  
16 invention. The present invention should only be limited by the following claims and their  
17 legal equivalents.